Patrick Coronado
Direct Readout Lab
GSFC Code 606.3

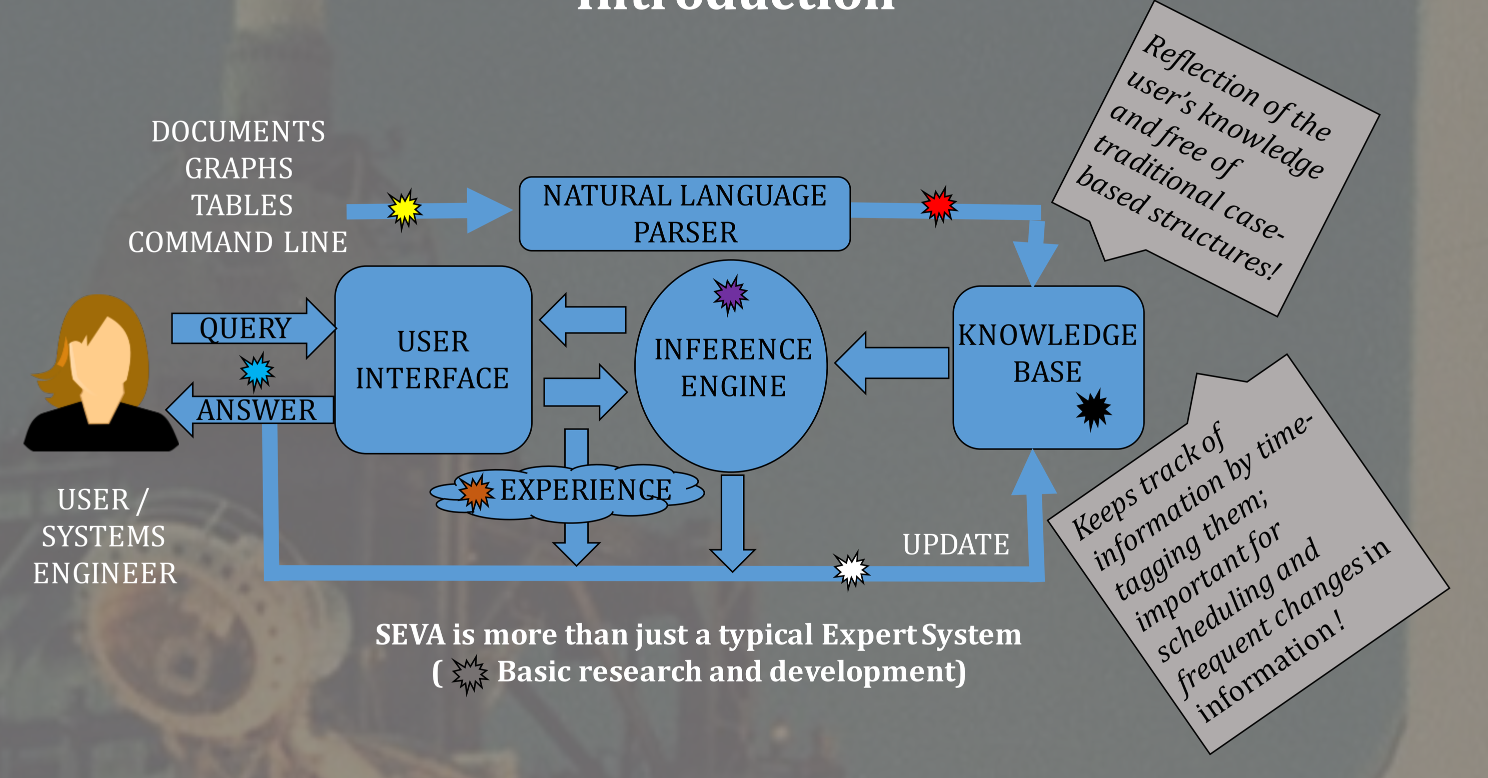
A Systems Engineer's Virtual Assistant (SEVA)

Jitin Krishnan
George Mason University
Trevor Reed
University of Southern California

Abstract

Systems Engineer's Virtual Assistant (SEVA) is a real-time, interactive system designed to assist a Systems Engineer in their daily work environment through complex information management and high level query-answering which will augment their problem-solving abilities. SEVA collects information by ingesting various types of discipline-specific documents including text, tables, graphs, and keyboard input. It uses natural language processing tools to convert the information into a knowledge base which is represented as an Ontology. It has the ability to handle information relating to schedule and resources. All information is time-tagged and saved, so that older versions of modified information can still be queried. SEVA is a personal system that becomes attuned to the individual using it. The main function of SEVA is to make logical inferences and derive new information when needed in order to answer questions asked by the user. SEVA also has an important capability to remember scenarios as experiences, thus making the knowledge representation a function of questions, answers, and rules which in turn keeps it free of traditional case-based structures. This research effort proposes an efficient combination of tools to be implemented in SEVA's information extraction, ontology building, and reasoning processes in addition to testing the soundness and feasibility of the designed system. The end result of this research will be a conceptual architecture for SEVA.

Introduction

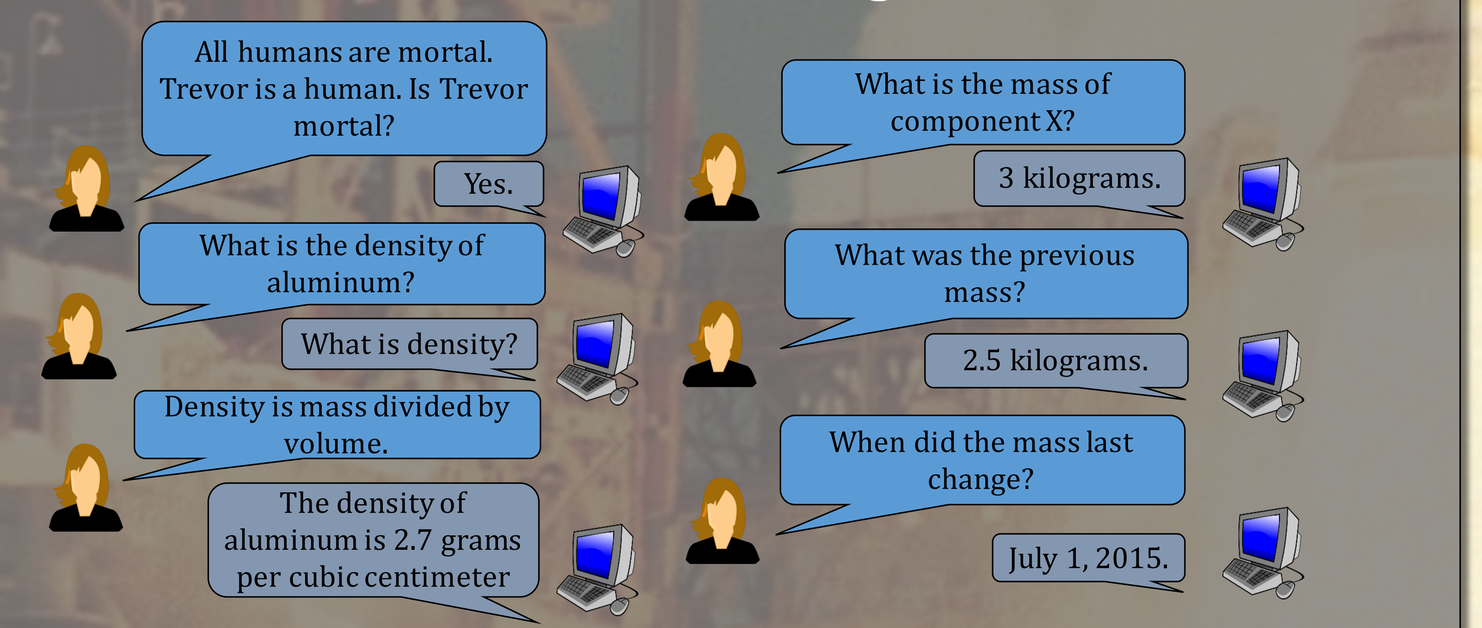


SEVA is more than just a typical Expert System
(Basic research and development)

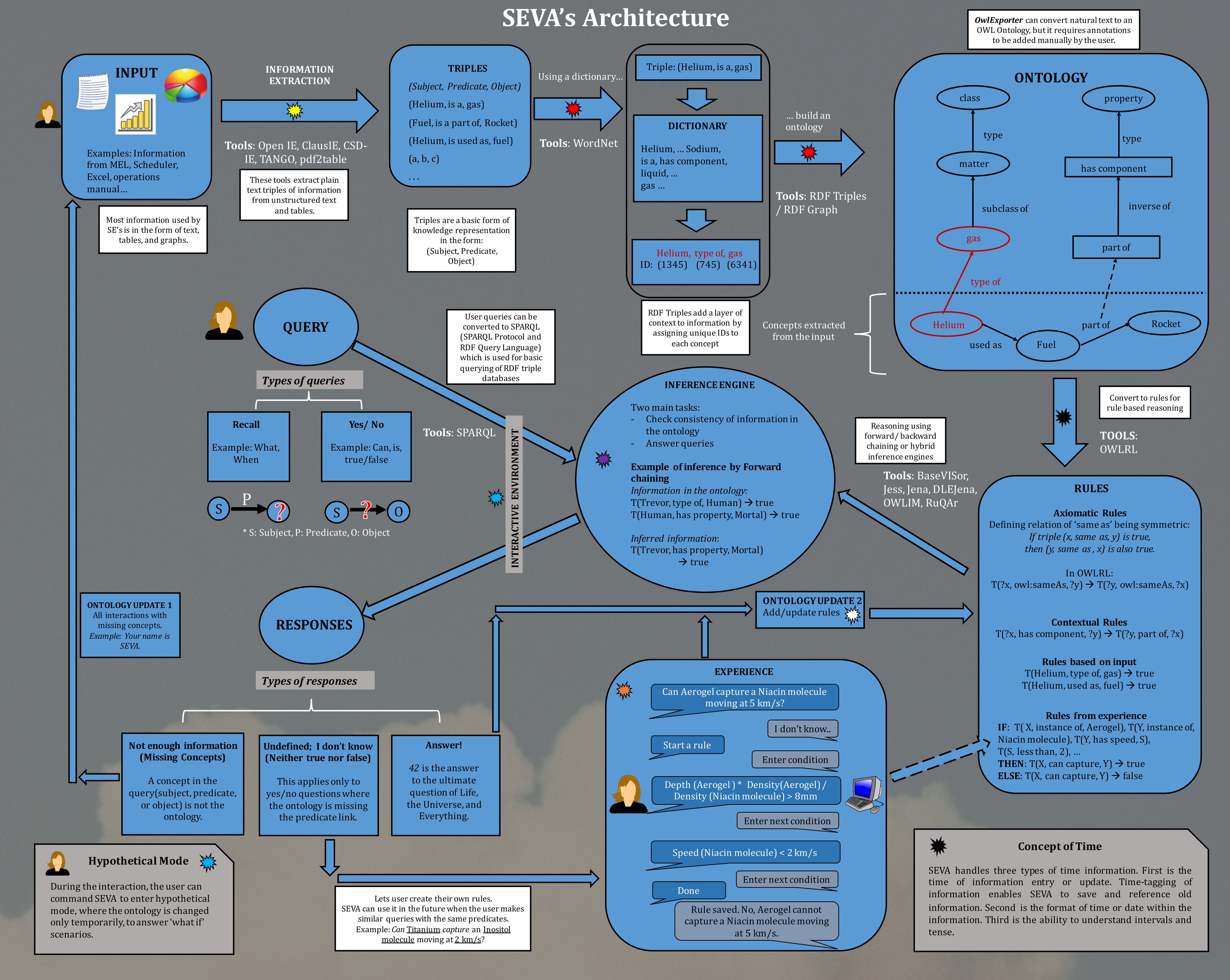
Why it matters to NASA?

Systems engineers deal with huge amounts of data in their everyday work. Their role in mission planning requires systems engineers to handle all of this information and to keep track of diverse requirements and changing variables. This extensive "bookkeeping" is both tedious and potentially dangerous, as it allows for the possibility of human error to leak into a project or mission. The ability of systems engineers could be greatly enhanced by a system that could handle the bookkeeping while leaving the creative problem-solving to the engineer. SEVA is being developed with this goal in mind: to assist systems engineers and enhance their problem-solving abilities by keeping track of the huge amounts of information of a project and using the information to answer reasoning, recall, and schedule queries from the user. Systems engineers are a vital part of any successful NASA mission, so the research and development of SEVA is directly beneficial to the future goals and missions of NASA.

Interactive Dialogue



SEVA's Architecture



How is SEVA different?

Other Expert Systems?
SEVA is designed in such a way that the knowledge base is free of traditional case-based structures. An important capability of SEVA is to remember scenarios as Experiences from the interaction with the user. This is similar to case-based reasoning but the structure is created in real-time and specific to the user. Usual expert systems, such as Medical Ontologies, reflect knowledge of an entire domain whereas SEVA reflects the knowledge of one specific systems engineer. This implies that SEVA's ontology is constantly evolving with each interaction. SEVA's ability to handle the concepts of time and ingest different types of input documents makes it a unique system.

MBSE? – Does not do inference
Although SEVA is not intended to be an alternative to MBSE as their problems and approaches are different, conceptually a mature SEVA can be inclusive of all functionalities of MBSE.

Similarities	Differences
Both MBSE and SEVA transition from paper-based book-keeping to electronic form.	The target of MBSE is a mission, its life cycles, and the integration of multiple domain knowledge. The target of SEVA is an individual Systems Engineer and thus its knowledge reflects the knowledge of the user rather than the knowledge of an entire domain.
Both MBSE and SEVA try to reduce human error and conflicts.	SEVA is designed to have a much easier learning curve as it operates just like an assistant, quite literally! This means that the user won't have to spend days learning how to operate the system.

Acknowledgements

Patrick Coronado
Direct Readout Laboratory
NASA GSFC Code 606.3

Edward G. Amatucci
Aerospace Engineer
NASA GSFC Code 592

GSFC Education Office
NASA GSFC Code 160

Logan Brentzel & Nick Perkins
Summer Interns
NASA GSFC Code 606.3

Thanks to everyone in the Direct Readout Laboratory
&
Special thanks to Sallie M. Smith and Maria Ealey
NASA GSFC Code 606.3